

**PATENT COOPERATION TREATY**  
**PCT**  
**INTERNATIONAL PRELIMINARY REPORT ON PATENTABILITY**  
(Chapter II of the Patent Cooperation Treaty)

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference <b>2022321PC/or</b>	<b>FOR FURTHER ACTION</b> See Form PCT/IPEA/416																									
International application No. <b>PCT/FI2004/000219</b>	International filing date ( <i>day/month/year</i> ) <b>08.04.2004</b>	Priority date ( <i>day/month/year</i> ) <b>11.04.2003</b>																								
<p>International Patent Classification (IPC) or national classification and IPC <b>E21B 47/01</b></p>																										
<p>Applicant <b>Sandvik Tamrock Oy et al</b></p>																										
<p>1. This report is the international preliminary examination report, established by this International Preliminary Examining Authority under Article 35 and transmitted to the applicant according to Article 36.</p> <p>2. This REPORT consists of a total of <u>4</u> sheets, including this cover sheet.</p> <p>3. This report is also accompanied by ANNEXES, comprising:</p> <p>a. <input checked="" type="checkbox"/> (<i>sent to the applicant and to the International Bureau</i>) a total of <u>3</u> sheets, as follows:</p> <p><input checked="" type="checkbox"/> sheets of the description, claims and/or drawings which have been amended and are the basis of this report and/or sheets containing rectifications authorized by this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions).</p> <p><input type="checkbox"/> sheets which supersede earlier sheets, but which this Authority considers contain an amendment that goes beyond the disclosure in the international application as filed, as indicated in item 4 of Box No. I and the Supplemental Box.</p> <p>b. <input type="checkbox"/> (<i>sent to the International Bureau only</i>) a total of (indicate type and number of electronic carrier(s)) _____, containing a sequence listing and/or tables related thereto, in computer readable form only, as indicated in the Supplemental Box Relating to Sequence Listing (see Section 802 of the Administrative Instructions).</p> <p>4. This report contains indications relating to the following items:</p> <table style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;"><input checked="" type="checkbox"/></td> <td style="width: 15%;"><b>Box No. I</b></td> <td style="width: 70%;">Basis of the report</td> </tr> <tr> <td><input type="checkbox"/></td> <td><b>Box No. II</b></td> <td>Priority</td> </tr> <tr> <td><input type="checkbox"/></td> <td><b>Box No. III</b></td> <td>Non-establishment of opinion with regard to novelty, inventive step and industrial applicability</td> </tr> <tr> <td><input type="checkbox"/></td> <td><b>Box No. IV</b></td> <td>Lack of unity of invention</td> </tr> <tr> <td><input checked="" type="checkbox"/></td> <td><b>Box No. V</b></td> <td>Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement</td> </tr> <tr> <td><input type="checkbox"/></td> <td><b>Box No. VI</b></td> <td>Certain documents cited</td> </tr> <tr> <td><input type="checkbox"/></td> <td><b>Box No. VII</b></td> <td>Certain defects in the international application</td> </tr> <tr> <td><input type="checkbox"/></td> <td><b>Box No. VIII</b></td> <td>Certain observations on the international application</td> </tr> </table>			<input checked="" type="checkbox"/>	<b>Box No. I</b>	Basis of the report	<input type="checkbox"/>	<b>Box No. II</b>	Priority	<input type="checkbox"/>	<b>Box No. III</b>	Non-establishment of opinion with regard to novelty, inventive step and industrial applicability	<input type="checkbox"/>	<b>Box No. IV</b>	Lack of unity of invention	<input checked="" type="checkbox"/>	<b>Box No. V</b>	Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement	<input type="checkbox"/>	<b>Box No. VI</b>	Certain documents cited	<input type="checkbox"/>	<b>Box No. VII</b>	Certain defects in the international application	<input type="checkbox"/>	<b>Box No. VIII</b>	Certain observations on the international application
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Date of submission of the demand <b>11.11.2004</b>	Date of completion of this report <b>09.12.2004</b>
Name and mailing address of the IPEA/SE Patent- och registreringsverket Box 5055 S-102 42 STOCKHOLM Facsimile No. +46 8 667 72 88	Authorized officer <b>Christer Bäcknert / MRO</b> Telephone No. +46 8 782 25 00

## Box No. I Basis of the report

1. With regard to the language, this report is based on the international application in the language in which it was filed, unless otherwise indicated under this item.

This report is based on a translation from the original language into the following language \_\_\_\_\_, which is the language of a translation furnished for the purposes of:

international search (under Rules 12.3 and 23.1(b))  
 publication of the international application (under Rule 12.4)  
 international preliminary examination (under Rules 55.2 and/or 55.3)

2. With regard to the elements of the international application, this report is based on (replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report):

the international application as originally filed/furnished

the description:

pages 1 - 10 as originally filed/furnished

pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

the claims:

pages \_\_\_\_\_ as originally filed/furnished

pages\* \_\_\_\_\_ as amended (together with any statement) under Article 19

pages\* 11 - 13 received by this Authority on 11.11.2004

pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

the drawings:

pages 1 - 3 as originally filed/furnished

pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

pages\* \_\_\_\_\_ received by this Authority on \_\_\_\_\_

a sequence listing and/or any related table(s) – see Supplemental Box Relating to Sequence Listing.

3.  The amendments have resulted in the cancellation of:

the description, pages \_\_\_\_\_  
 the claims, Nos. \_\_\_\_\_  
 the drawings, sheets/figs \_\_\_\_\_  
 the sequence listing (specify): \_\_\_\_\_  
 any table(s) related to the sequence listing (specify): \_\_\_\_\_

4.  This report has been established as if (some of) the amendments annexed to this report and listed below had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).

the description, pages \_\_\_\_\_  
 the claims, Nos. \_\_\_\_\_  
 the drawings, sheets/figs \_\_\_\_\_  
 the sequence listing (specify): \_\_\_\_\_  
 any table(s) related to the sequence listing (specify): \_\_\_\_\_

\* If item 4 applies, some or all of those sheets may be marked "superseded."

## Box No. V    Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement

## 1. Statement

Novelty (N)	Claims	<u>1-16</u>	YES
	Claims	_____	NO
Inventive step (IS)	Claims	<u>1-16</u>	YES
	Claims	_____	NO
Industrial applicability (IA)	Claims	<u>1-16</u>	YES
	Claims	_____	NO

## 2. Citations and explanations (Rule 70.7)

## Documents cited in the International Search Report:

D1: US4715446 A1  
 D2: US4690214 A1  
 D3: EP0553732 A1

The invention relates to a drill hole measuring device and a rock drilling unit. It is intended to measure the straightness and dimensions of downward oriented drill holes and comprises at least one sensor; an elongated transmission element connected to the sensor; at least one transfer device, by which the transmission element can be moved longitudinally in at least one direction for moving the sensor in the drill hole. Further, the invention comprises an elongated protective element with a lower part and an upper part, the lower part of the protective element being designed such that it can be inserted partly into the drill hole and the sensor is arranged to be moved into the protective element by means of the transfer device.

D1 discloses a device and a method for protecting a tool such as a measuring instrument in a well, this instrument being fixed to the end of a drill string. The measuring instrument (1) is protected by a protective casing (4). This reference does not disclose a complete measuring device; rather it shows a measuring device inside a protective casing at the end of a drill string (2). Further, the measuring instrument (1) is not arranged to be moved into the protective casing (4) by means of the drill string (2) (transfer device). Consequently, the claimed invention differs from the cited prior art; it is therefore new.

.../...

## Supplemental Box

In case the space in any of the preceding boxes is not sufficient.

Continuation of: BOX V

None of the cited documents give any indication that would lead a person skilled in the art to the claimed portable drill hole measuring device or rock drilling unit comprising such a measuring device. Thus, the claimed invention is not obvious to a person skilled in the art.

Accordingly, the invention defined in claims 1-16 is novel and is considered to involve an inventive step.

The invention is industrially applicable.

11-11-2004

CLAIMS

1. A portable drill hole measuring device comprising:  
a frame (2);  
at least one sensor (6);  
an elongated transmission element (5) connected to the sensor (6);  
at least one transfer device (4), by which the transmission element (5) can be moved longitudinally in at least one direction for moving the sensor (6) in the drill hole (12), **characterized** in that

the measuring device (1) includes an elongated protective element (3) and comprising a lower part and an upper part,

that the lower part of the protective element (3) is designed such that it can be inserted partly into the drill hole (12), and

that the sensor (6) is arranged to be moved into the protective element (3) by means of the transfer device (4).

2. A measuring device as claimed in claim 1, **characterized** in that at a first end of the protective element (3) there is a conical portion (13), which can be inserted into the drill hole (12) at least partly.

3. A measuring device as claimed in claim 1 or 2, **characterized** in that at the first end of the protective element (3) there is at least one support piece (10), which is arranged to hold the protective element (3) in a desired position.

4. A measuring device as claimed in any one of the preceding claims, **characterized** in that the protective element (3) is designed at least for its first end portion such that the protective element (3) can be inserted at least partly into the drill hole (12).

5. A measuring device as claimed in any one of the preceding claims, **characterized** in that the protective element is a tubular piece.

6. A measuring device as claimed in any one of the preceding claims, **characterized** in

that the transmission element (5) is a flexible, elongated piece, and  
that the transfer device (4) comprises a reel (8), around which the transmission element (5) can be wound.

7. A measuring device as claimed in claim 6, **characterized** in that the reel (8) is provided with a handle (15) for rotating the reel (8) manually.

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8. A measuring device as claimed in claim 6, **characterized** in that the transfer device (4) comprises a motor (7) for rotating the reel (8).

9. A measuring device as claimed in any one of the preceding claims, **characterized** in that the measuring device (1) comprises at least one actuator (21) for pushing the protective element (3) partly into the drill hole (12).

10. A measuring device as claimed in any one of claims 1 to 5, **characterized** in

that the transmission element (5) is a flexible, elongated piece,

that the measuring device (1) comprises a container (40), which is arranged stationary with respect to the frame of the measuring device (1), for storing the transmission element (5),

that the transfer device (4) comprises at least one roll, which is arranged to move the transmission element (5) in the longitudinal direction by friction, and

that the transmission element (5) is arranged to settle within the space delimited by the inner surface (43) of the container (40).

11. A measuring device as claimed in any one of the preceding claims, **characterized** in

that the transmission element (5) is a flexible, elongated piece,

that the measuring device (1) comprises a container (40), which is arranged stationary with respect to the frame of the measuring device (1), for storing the transmission element (5),

that the transfer device (4) comprises at least one roll, which is arranged to move the transmission element (5) in the longitudinal direction by friction,

that the transfer device (4) is arranged rotatably about the longitudinal axis (48) of the protective element (3), and

that the transmission element (5) is arranged to settle within the space delimited by the inner surface (43) of the container (40).

12. A measuring device as claimed in any one of the preceding claims, **characterized** in that the measuring device (1) is arranged in a rock drilling unit (16).

13. A measuring device as claimed in any one of the preceding claims, **characterized** in that the measuring device (1) is arranged in a charging unit (50).

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14. A rock drilling unit comprising:  
at least one feeding beam (20);  
at least one rock drilling apparatus (18), which is movable with respect to the feeding beam (20); and  
at least one measuring device (1) for measuring drill holes (12), the measuring device (1) comprising: a frame (2); at least one sensor (6) that may be arranged in a drill hole (12); an elongated transmission element (5) connected to the sensor (6); and at least one transfer device (4), by which the transmission element (5) may be moved longitudinally for moving the sensor (6) in the drill hole (12),

**c h a r a c t e r i z e d** in that

the measuring device (1) includes an elongated protective element (3), into which the sensor (6) is arranged to be moved by means of the transfer device (4).

15. A rock drilling unit as claimed in claim 14, **c h a r a c t e r i z e d** in

that the first end portion of the feeding beam (20) comprises a first holder (21) for mounting the measuring device (1), and

that the second end portion of the feeding beam (20) comprises a second holder (23) for mounting at least the sensor of the measuring device (1),

that the measuring device (1) is mountable on the first holder (21) for measuring the drill hole (12) by means of the sensor (6), and

that at least the sensor of the measuring device is mountable on the second holder (23) for positioning and aligning the drilling unit (16) by means of the sensor (6).

16. A rock drilling unit as claimed in claim 14 or 15, **c h a r a c t e r i z e d** in

that the rock drilling unit (16) comprises at least one actuator (21) for moving the protective element (3) of the measuring device (1) longitudinally,

that the protective element (3) can be inserted into the drill hole (12), and

that the sensor (6) can be inserted inside the protective element (3) into the drill hole (12).

# INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 2004/000219

## A. CLASSIFICATION OF SUBJECT MATTER

**IPC7: E21B 47/01**

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

**IPC7: E21B**

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

**SE,DK,FI,NO classes as above**

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

**EPO-INTERNAL, PAJ**

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 4715446 A (C. WITTRISCH), 29 December 1987 (29.12.1987), whole document  --	1,3-9
A	US 4690214 A (C. WITTRISCH), 1 Sept 1987 (01.09.1987)  --	1-16
A	EP 0553732 A1 (BAKER HUGHES INCORPORATED), 4 August 1993 (04.08.1993)  -----	1-16

Further documents are listed in the continuation of Box C.

See patent family annex.

\* Special categories of cited documents:

- "A" document defining the general state of the art which is not considered to be of particular relevance
- "B" earlier application or patent but published on or after the international filing date
- "L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)
- "O" document referring to an oral disclosure, use, exhibition or other means
- "P" document published prior to the international filing date but later than the priority date claimed

"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

2 August 2004

Date of mailing of the international search report

03-08-2004

Name and mailing address of the ISA/  
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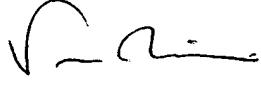
## INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 2004/000219

US	4715446	A	29/12/1987	CA	1267359	A	03/04/1990
				DE	3661032	D	00/00/0000
				EP	0206917	A,B	30/12/1986
				FR	2583815	A,B	26/12/1986
				JP	1785064	C	31/08/1993
				JP	4066994	B	26/10/1992
				JP	62111094	A	22/05/1987
				NO	170355	B,C	29/06/1992
				NO	862405	A	22/12/1986
US	4690214	A	01/09/1987	CA	1238849	A	05/07/1988
				DE	3476775	D	00/00/0000
				DK	160628	B,C	02/04/1991
				DK	179884	A	08/10/1984
				EP	0122839	A,B	24/10/1984
				FR	2544013	A,B	12/10/1984
				IN	160484	A	11/07/1987
				MX	170100	B	06/08/1993
				NO	162580	B,C	09/10/1989
				NO	841346	A	08/10/1984
EP	0553732	A1	04/08/1993	CA	2088452	A	01/08/1993
				NO	930324	A	02/08/1993
				US	5294923	A	15/03/1994

VIII-4-1	<p>Declaration: Inventorship (only for the purposes of the designation of the United States of America) Declaration of Inventorship (Rules 4.17(iv) and 51bis.1(a)(iv)) for the purposes of the designation of the United States of America:</p> <p>I hereby declare that I believe I am the original, first and sole (if only one inventor is listed below) or joint (if more than one inventor is listed below) inventor of the subject matter which is claimed and for which a patent is sought.</p> <p>This declaration is directed to international application PCT/FI2004/000219 (if furnishing declaration pursuant to Rule 26ter).</p> <p>I hereby declare that my residence, mailing address, and citizenship are as stated next to my name.</p> <p>I hereby state that I have reviewed and understand the contents of the above-identified international application, including the claims of said application. I have identified in the request of said application, in compliance with PCT Rule 4.10, any claim to foreign priority, and I have identified below, under the heading "Prior Applications", by application number, country or Member of the World Trade Organization, day, month, and year of filing, any application for a patent or inventor's certificate filed in a country other than the United States of America, including any PCT international application designating at least one country other than the United States of America, having a filing date before that of the application on which foreign priority is claimed.</p>
VIII-4-1- 1	Prior applications: 20030553, FI, 11 April 2003 (11.04.2003)

		<p>I hereby acknowledge the duty to disclose information that is known by me to be material to patentability as defined by 37 C.F.R. § 1.56, including for continuation-in-part applications, material information which became available between the filing date of the prior application and the PCT international filing date of the continuation-in-part application. I hereby declare that all statements made herein of my own knowledge are true and that all statements made on information and belief are believed to be true; and further that these statements were made with the knowledge that willful false statements and the like so made are punishable by fine or imprisonment, or both, under Section 1001 of Title 18 of the United States Code and that such willful false statements may jeopardize the validity of the application or any patent issued thereon.</p>
VIII-4-1- 1-1	Name (LAST, First)	UITTO, Vesa
VIII-4-1- 1-2	Residence: (city and either US State, if applicable, or country)	Tampere, Finland
VIII-4-1- 1-3	Mailing address:	Välikuja 4 FI-33720 Tampere Finland
VIII-4-1- 1-4	Citizenship:	FI
VIII-4-1- 1-5	Inventor's Signature: (If not contained in the request, or if declaration is corrected or added under Rule 26ter after the filing of the international application. The signature must be that of the inventor, not that of the agent)	
VIII-4-1- 1-6	Date: (of signature which is not contained in the request, or of the declaration that is corrected or added under Rule 26ter after the filing of the international application)	TAMPERE 26. 04. 2004